

CLAIMS

What is claimed is:

- 5 1. A fuel cell comprising at least one etch-processed, conductive, porous film comprising at least one electrode, wherein said film comprises at least one dielectric layer and at least one conductive layer, and wherein said at least one conductive layer comprises at least one material selected from the group consisting of gold, aluminum, platinum, and a conductive organic material.
- 10 2. The fuel cell of claim 1 wherein said dielectric layer comprises silicon.
3. The fuel cell of claim 2 wherein said dielectric layer comprises silicon nitride.
4. The fuel cell of claim 3 wherein said dielectric layer comprises pores formed by reactive
15 ion etching.
5. The fuel cell of claim 1 further comprising at least one catalyst disposed on the conductive layer.
- 20 6. The fuel cell of claim 5 wherein said at least one catalyst comprises platinum.
7. The fuel cell of claim 5 wherein said at least one catalyst is deposited by an ink deposition process.
- 25 8. The fuel cell of claim 1 further comprising at least one support substrate supporting said film.

9. The fuel cell of claim 8 wherein said support substrate comprises at least one fuel flow path for providing fuel to said electrode.

10. The fuel cell of claim 1 wherein said porous film comprises a plurality of pores perforating said film, wherein diameters of said pores are 0.18-1 microns.

11. The fuel cell of claim 10 wherein said support substrate is etched.

12. The fuel cell of claim 1 wherein said electrode comprises an etch and anodization processed, silicon-based, porous electrode.

13. The fuel cell of claim 1 wherein said fuel cell is operable to produce electricity from hydrogen and oxygen.

14. The fuel cell of claim 1 wherein said fuel cell is operable to produce hydrogen and oxygen from water.

15. The fuel cell of claim 1 wherein said film is 1-20 microns in thickness.

16. The fuel cell of claim 1 comprising a plurality of said electrodes arranged as a planar array.

17. The fuel cell of claim 16 wherein said planar array of electrodes comprises an interdigitated array of cathodes and anodes.

18. The fuel cell of claim 17 wherein a surface area of each cathode is approximately four times larger than a surface area of each anode.

19. A method of combinatorial experimentation comprising the steps of:
- providing materials for making fuel cells wherein the materials comprise a silicon substrate;
 - making a plurality of fuel cells on the silicon substrate; and
 - testing the fuel cells.